

Video-Assisted Thoracoscopy for the Diagnosis of Mediastinal Masses in Children

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ABSTRACT

Background and Objectives: Video-assisted thoracoscopy has been successfully used for several different thoracic procedures in adults. However, its use in children has been limited. The present study evaluated our experience with video-assisted thoracoscopy in the diagnosis of mediastinal masses in children.

Methods: Nine children (age range, 3 to 18 years) with undiagnosed mediastinal masses underwent video-assisted thoracoscopy. The operation was performed using general anesthesia, with the patient intubated with a single lumen endotracheal tube.

Results: In all cases adequate tissue for diagnosis was obtained. Three patients had tuberculosis, two had Hodgkin's disease, two had granuloma, one had metastatic Wilms' tumor, and one had thymic hyperplasia. There were no complications related to the operative procedure.

Conclusions: Video-assisted thoracoscopy for the diagnosis of mediastinal masses in children is a safe procedure. It provides good visualization, access to the mediastinum and adequate tissue for diagnosis. Further, postoperative discomfort is tolerable and cosmetic results are excellent.

Key Words: Adolescence, Child, Mediastinal diseases, Mediastinal neoplasms, Thoracoscopy.

INTRODUCTION

The accurate diagnosis and treatment of mediastinal masses often depends on the adequacy of biopsy tissue specimens. In this situation tissue for diagnosis is usually obtained via a standard thoracotomy. However, surgical morbidity is common and recovery may be prolonged.¹ Some patients with mediastinal masses are debilitated and neutropenic, and have an increased risk for infection and poor wound healing.² In an effort to diminish the potential risks and complications of open thoracotomy, video-assisted thoracoscopy has emerged as a minimally invasive surgical alternative. Thoracoscopy has been used to diagnose and remove mediastinal and pulmonary masses,³⁻⁹ debride empyema,^{10,11} drain pleural effusions,¹² perform vascular ring division,¹³ and ligate patent ductus arteriosus.^{14,15} In the present report, we describe our successful experience with video-assisted thoracoscopy in the diagnosis of mediastinal masses in children.

PATIENTS AND METHODS

Nine pediatric patients with undiagnosed intrathoracic masses were evaluated for thoracoscopy by our team. There were six males and three females, with ages ranging from 3 to 18 years (**Table 1**). Clinical presentation included respiratory symptoms, chest pain, malaise, weight loss and fever. In all patients, the mediastinal masses were identified by three different imaging studies, i.e., chest radiographs, computerized tomography and magnetic resonance imaging. The surgical alternatives were discussed with parents/guardians, and informed consent was obtained for thoracoscopy. Subsequently, seven children had a right thoracoscopy and two had a left thoracoscopy. The imaging studies aided the determination of the side of the thoracoscopy approach.

Surgical Procedure:

The procedure was performed with the patient in full lateral decubitus thoracotomy position. General anesthesia with single lumen endotracheal intubation was used in all patients. Although endotracheal intubation with a double lumen tube could have been possible in the adolescent group, it was not feasible in the younger patients. After discussion with the anesthesiologist, we elected to use single

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Table 1.
Diagnosis of mediastinal masses using
video-assisted thoracoscopy

Pt	Sex	Age (yr)	Location	Diagnosis
1	M	3	Mediastinum	Thymic hyperplasia
2	F	3	Mediastinum and lung	Granuloma
3	F	9	Mediastinum	Wilms' tumor
4	M	11	Mediastinum and lung	Tuberculosis
5	M	13	Mediastinum	Mycobacterium avium-intracellulare
6	M	13	Mediastinum	Granuloma
7	F	16	Mediastinum	Hodgkin's disease
8	M	17	Mediastinum	Hodgkin's disease
9	M	18	Mediastinum	Tuberculosis

lumen endotracheal tubes in all patients in order to expedite the procedure and to decrease trauma to the airway.

The patient's lung was collapsed by applying carbon dioxide flow with low pressure settings to the pleural cavity. This technique necessitated a closed-system thoracoscopy which was achieved by using standard trocars with diaphragms. Possible mediastinal shift caused by excessive pressure was carefully watched for, as it could result in impaired ventilation and decreased blood return to the heart.

A 5 mm scope was used in most patients. Three ports were necessary in order to retract and expose different anatomical structures, and 5 mm ports were adequate to retrieve tissue in most patients. Use of electrocautery was limited at the beginning of the procedure in order to minimize damage to the specimen. The biopsies were performed with a variety of biopsy forceps, with the regular laryngeal cup biopsy forceps used the most. Close communication with the pathologist was maintained during the procedure to ensure that the tissue sampling was adequate for diagnostic examination and also to ensure that the specimen was properly handled and processed.

At the end of the procedure, intercostal block was induced with bupivacaine for control of pain, and a chest tube was placed through the lowest port.

RESULTS

In all nine cases histological and/or bacteriological diagnosis was obtained (**Table 1**). Three patients had tuberculosis (two with *Mycobacterium tuberculosis* and one with *Mycobacterium avium-intracellulare*), two had Hodgkin's disease, two had benign granulomatous lesions most likely related to foreign body reaction, one had metastatic Wilms' tumor, and one had thymic hyperplasia.

There were no intra- or postoperative complications. Postoperative pain was mild to moderate and easily managed with intravenous narcotics or oral acetaminophen/codeine. In eight patients the chest tubes were removed within 48 hours, and in one patient the chest tube was removed within 72 hours. The cosmetic results in all patients were excellent.

In the patient with metastatic Wilms' tumor, tumor spillage occurred during the biopsy of the posterior mediastinal mass. The tumor was refractory to therapy and ultimately invaded the spinal canal, resulting in paralysis. The patient died of disseminated metastatic disease 4 months post-thoracoscopy. No tumor spillage occurred in the two patients with Hodgkin's disease.

DISCUSSION

Video-assisted thoracoscopy has been successfully used for several different thoracic procedures in adults. However, its use in children has been limited. In the present study, thoracoscopy provided adequate tissue for the diagnosis of mediastinal masses in children. It resulted in minimal morbidity and reduced hospitalization. None of the patients, moreover, required conversion to open thoracotomy.

Thoracoscopy has been compared favorably to open thoracotomy for the diagnosis of pulmonary nodules.⁹ In a study of thoracoscopic vascular ring division in infants and children, it was found to be largely successful.¹³ However, three of the eight patients in the study required conversion to limited thoracotomy for the completion of the procedure. In another study, thoracoscopy was used for the management of intrathoracic disease in 52 adult patients.¹⁶ It was successful in all but 14 patients who required conversion to formal thoracotomy. In these two studies, the need for conversion to the open procedure may be explained by the difficulty in exposing deep anatomy and centrally located lesions in the mediastinum.

Tumor implantation can occur as a consequence of thoracoscopy and may be fatal. In one reported case, incisional and chest wall recurrences resulted in death.¹⁷ In another case, extensive trocar and diaphragmatic implants developed after thoracoscopic resection of a solitary pulmonary metastasis from a primary limb sarcoma.¹⁸ These recurrences were identified within 5 months post-thoracoscopy. In the present series, significant spillage occurred during the biopsy done in the patient with a posterior mediastinal Wilms' tumor, but it did not contribute to the patient's demise because metastasis had occurred prior to the thoracoscopy. Given the possibility of tumor spillage, special attention must be paid to those tumors likely to contaminate the pleural cavity. Precautions to prevent tumor spillage should include the use of a pouch or similar device to retrieve the specimen.

CONCLUSION

In our experience, video-assisted thoracoscopy proved to be an efficacious alternative to open thoracotomy in the diagnosis of mediastinal masses in children. It is a safe procedure with minimal morbidity. It provides good visualization of the mediastinum and adequate tissue for diagnosis. Postoperative discomfort is tolerable and cosmetic results are excellent. With further refinements in instrumentation and skills, video-assisted thoracoscopy should become the technique of choice in patients with intrathoracic disease.

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